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Racial/ethnic disparities in health-related quality of life and health status across pre-, early-, and mid-adolescence: a prospective cohort study

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Abstract

Purpose To examine (1) racial/ethnic disparities in health-related quality of life (HRQOL) and overall health status among Black, Latino, and White youth during adolescence; (2) whether socioeconomic status (SES) and family contextual variables influence disparities; and (3) whether disparities are consistent from pre- to early- to mid-adolescence.

Methods A population sample of 4823 Black (1755), Latino (1812), and White (1256) youth in three US metropolitan areas was prospectively assessed in a longitudinal survey conducted on three occasions, in 5th, 7th, and 10th grades, when youth reported their HRQOL using the PedsQL™ short-form Total, Physical and Psychosocial scales and youth and parents separately reported on youth's overall health status. Parents reported their education and household income to index SES, family structure, and use of English at home.

Results Based on analysis conducted separately at each grade, marked racial/ethnic disparities were observed across all measures of HRQOL and health status, favoring White and disfavoring Black, and especially Latino youth. More strongly present in 5th and 7th grade, HRQOL disparities decreased by 10th grade. Most disparities between White and Black youth disappeared when adjusting for SES. However, even after adjusting for SES, family structure, and English use, overall health status disparities disfavoring Latino youth remained across all three assessments.

Conclusions Racial/ethnic disparities in adolescent HRQOL and health are substantial. These disparities appear consistent from pre- to early-adolescence but diminish for HRQOL by mid-adolescence. As disparities appear influenced by SES and other family contextual variables differently in different racial/ethnic groups, efforts to reduce health disparities in youth should address culturally specific conditions impinging on health.

Keywords Race · Ethnicity · Disparities · Health-related quality of life · Socioeconomic status · Longitudinal

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Abbreviations

HRQOL	Health-related quality of life
OHS	Overall health status
PedsQL™	Pediatric Quality of Life Inventory
SES	Socioeconomic status
GLM	General linear model

Introduction

Health disparities, according to Centers for Disease Control [1], are preventable differences in the burden of disease, injury, violence, or opportunities to achieve optimal health that are experienced by socially disadvantaged populations. There is clear evidence that Black and Latino youth experience disparities in health compared to White youth that are,

according to the American Academy of Pediatrics “extensive, pervasive, and persistent, and occur across the spectrum of health....” (p. e979 a) [2]. However, this conclusion is overwhelmingly based on studies of mortalities, specific disease morbidities (e.g., asthma, obesity), and other focused indicators (e.g., injuries, access to care,) [2], which provide a limited perspective on health, especially in the general population. Examining broader indications of health provides several advantages for understanding disparities in the general population [3, 4].

One reason for a broader perspective on health is that relatively few experience any one specific disease or die [5]. Another advantage is that this broader approach better matches the World Health Organization’s [6] definition of health as being “a complete state of physical, mental, and social well-being, not merely the absence of disease.” Health-related quality of life (HRQOL) matches well this broader conception of health. A typical definition states that HRQOL is a “multi-dimensional concept that includes domains related to physical, mental, emotional, and social functioning. It goes beyond direct measures of population health, life expectancy, and causes of death, and focuses on the impact health status has on quality of life” [7]. HRQOL is important to examine in youth not just because it reflects health broadly, but also because it conveys information about essential daily functioning [8]. Physical HRQOL addresses how youth can engage in daily activities, whereas psychosocial HRQOL captures how they feel about and perceive themselves and their lives, the quality of their relationships, and function in critical roles, such as student [4, 9]. Thus, HRQOL provides a broader assessment of health and well-being than the traditional bio-medical approach.

Nonetheless, we know of just a few studies that have examined racial/ethnic disparities in self-reported HRQOL in youth within a general population sample. Findings from two studies on a sample of 5th graders revealed marked racial/ethnic disparities across multiple measures of HRQOL and health status, favoring White youth and disfavoring especially Latino youth, with Black youth generally in between these two groups [3, 4]. Likewise, a study on a sample of 8- to 18-year old children found marked racial/ethnic disparities in HRQOL, with the same pattern of group differences [10]. In contrast, another study reported no differences among Black, Latino, and White groups [11], but the absence of disparities may have been because the sample comprised only lower socioeconomic status (SES) children, which would have controlled for SES.

A complimentary broad measure of children’s health is provided by asking parents simply to report whether a child’s health is excellent, very good, good, fair, or poor. Studies that have obtained such parent report have generally confirmed significantly poorer overall health status of Black and Latino youth compared to White youth in the

general population [3, 12–16]. Disparities in parental rating of health status have remained when controlling for parental education and income or poverty status in some [12, 15, 16] but not all [3] studies that tested covariates. Disparities have also remained when controlling for residing in a non-English speaking home [15]. In comparison, we know of only two studies on racial/ethnic disparities in HRQOL that have examined whether social-contextual factors may be contributing to the observed disparities. Results from studies on a sample of 5th graders revealed that disparities in HRQOL were no longer significant after adjusting for SES, family structure, and residing in a non-English speaking home [3, 4].

Thus, it appears that two different approaches to measuring children’s broadly construed health may produce different results. Parental ratings of health status appear more likely to show racial/ethnic disparities over and beyond any that may be due to socioeconomic and other contextual differences [12, 15, 16], whereas youth self-report of HRQOL does not [3, 4]. However, these discrepancies are based on different types of samples including different ages. It would be beneficial to compare results from these different approaches to measuring broadly construed health in youth in the same study.

In addition, whereas health disparities are readily observed for racial/ethnic minority groups, it is less clear what can explain them. Racial/ethnic disparities may be due to longstanding differences in how society has treated certain groups, including both explicit and implicit discrimination [17]. However, racial/ethnic groups also differ on average in several ways beyond their racial/ethnic identification. Socioeconomic status (SES) and minority racial/ethnic status are closely intertwined, with members of many minority groups, on average, being lower in SES, which is also known to affect health [18]. Other family contextual differences between racial/ethnic groups may also contribute to the observed racial/ethnic disparities. Indeed, a few prior studies of racial/ethnic disparities in HRQOL and health status ratings found that when family structure and language spoken at home are covaried, observed disparities are reduced [3, 4, 15]. We are not aware of any study that has tested the unique contribution of race/ethnicity to HRQOL and health status in youth while covarying several of these other differences among racial/ethnic groups.

Another limitation in previous research examining HRQOL as well as overall health in childhood is the preponderance of cross-sectional studies. Indeed, little is known about how health disparities may change as youth experience challenges and individuation associated with adolescent development. Therefore, there is a significant need for longitudinal research examining broadly construed health during adolescence. Our main aim in this study therefore was to advance the understanding of racial/ethnic disparities

in broadly construed health during adolescent development, by addressing the following questions: (1) Are there disparities in HRQOL and overall health status among Black, Latino, and White youth during adolescent development?; (2) To what extent do SES and other family contextual differences contribute to such disparities among these groups; and (3) Are racial/ethnic disparities in HRQOL and overall health status manifested consistently from pre- to early- to mid-adolescence? To address these questions, we used data from three waves of Healthy Passages, a multi-site prospective longitudinal community cohort study of adolescent health. Whereas previous publications reported disparities in HRQOL and health status on the same cohort in 5th grade [3, 4], the present study extends this work by additionally analyzing data from this cohort prospectively followed up in 7th and 10th grade.

Methods

Institutional review boards at each study site and the Centers for Disease Control and Prevention approved this study.

Study design and participants

Participants were recruited through public schools in and around Birmingham, Alabama; Houston, Texas; and Los Angeles County, California, from 2004 to 2006, following procedures detailed elsewhere [3, 19]. This resulted in 4823 Black, Latino, and White 5th grade students being enrolled in the study with the unweighted (and weighted) distribution of 36% (30%) Black, 38% (47%) Latino, and 26% (23%) White, 51% (49%) females, and youth age $M = 11.16$. Additional demographics are shown in Table 1 and have been detailed elsewhere [3]. This enrolled study sample closely resembled the sampled population and all eligible students on basic demographic characteristics. After 2 and 5 years, 4,441 (retention: total sample = 92%, Black = 93%, Latino = 91%, White = 92%) and 4,048 (retention: total sample = 84%, Black = 85%, Latino = 83%, White = 82%) families completed follow-up assessments, when the vast majority of youth were in 7th (age $M = 13.10$) and 10th (age $M = 16.12$) grade, respectively. The distribution across demographic variables in subsequent assessments was essentially identical to that in 5th grade.

Procedures

The same procedures were applied across all three assessments. A parent (mother, 88%; father, 6%; other, 6%) provided written informed consent and the youth provided assent to participate. Subsequently, parent and youth interviews were conducted in separate private spaces by trained

Table 1 Sample demographics at enrollment in 5th grade

	Total analysis sample		Black	Latino	White
	Raw <i>n</i>	Wtd %	Wtd %	Wtd %	Wtd %
Total	4823	100	30	47	23
Highest education in household					
< 9th grade	365	10	1	21	0
Some high school	565	14	9	24	3
High school graduate	995	22	31	24	9
Some college or 2-year degree	1284	25	37	21	17
Bachelor degree	801	15	14	6	33
> Bachelor degree	732	13	8	4	38
Household income/year					
< \$10,000	729	17	26	18	3
\$10–\$19,999	680	17	18	24	4
\$20–\$34,999	969	24	26	30	8
\$35–\$69,999	941	21	20	19	24
\$70–\$124,999	655	13	8	6	33
\$125,000+	471	9	2	2	29
Family structure					
Two biological parents	2152	47	21	55	65
Other	2641	53	80	45	35
English spoken at home (if no, self-rated proficiency level)					
Yes	2975	55	96	10	91
No/very well	474	10	3	17	5
No/well	338	8	1	16	4
No/not well	677	18	0	39	0
No/not at all	321	9	0	19	0

Wtd weighted

% is calculated with weights to reflect sampling design

staff. Computer-assisted personal interview was used for both parent and youth for the portion of the assessments relevant to this study. A Spanish version could be chosen by either at each assessment, except for youth at 10th grade (applied partly or fully at 5th grade: 8% of youth, 23% of parents; 7th grade: 4% of youth, 30% of parents; 10th grade: 30% of parents). The computer interview protocols required a response on each item to move forward to the next, resulting in few missing data. The following variables were used in this study.

Outcome variables

Health-Related Quality of life (HRQOL) was measured with the youth self-report form of the Pediatric Quality of Life Inventory Version 4.0™ (PedsQL™) [20], a widely used, well-validated measure of children's HRQOL. For example, in a study involving 5653 children [10], the PedsQL™ demonstrated high construct validity when healthy youth

reported significantly higher HRQOL in all domains than chronically ill peers. To reduce response burden in the 10th-grade assessment, the 15-item short-form of the PedsQL™ [21] was used. Consequently, to obtain the identical measure of HRQOL across the three assessments, scale scores were calculated for the short-form scales from each assessment, i.e., for Physical HRQOL based on 5 items, Psychosocial HRQOL based on 10 items, and Total HRQOL based on 15 items. The psychometric properties of this short-form have been reported generally to be comparable with the original, with the caveat that the internal consistency reliability of the shortened Physical HRQOL scale was reduced [21]. The scale structure has been replicated with equivalent reliabilities across race/ethnic groups [22]. Each item asks how much a certain behavior has been a problem in the past month, with responses provided on a 5-point scale (0 = *never a problem*, 4 = *almost always a problem*). Scale scores are transformed and calculated such that a higher score indicates better HRQOL.

Overall health status (OHS) was reported by the youth and parent, separately, using the single item, “In general, would you say your/your child’s health is. . .,” with a 5-point response scale (*excellent, very good, good, fair, poor*). Findings from this item in numerous youth health surveys have been consistent with theoretical expectations and support its validity as a measure of OHS [23–25]. Herein, a higher score indicates better health status.

Exposure variables

For *race/ethnicity*, the parent was asked whether the youth belongs to any of several Latino groups, followed by which of seven racial/ethnic groups applied, consistent with the Office of Management and Budget standards. Latino ethnicity was determined using Census-Style classification, wherein the youth was classified as Latino if the parent indicated this ethnicity regardless of responses regarding race. Youth not categorized as Latino were classified as Black, White, or Other based on parent report (the 6% reporting Other was removed from analysis).

SES and the family contextual variables were parent reported. Because SES is multifaceted [18] and no single variable adequately captures this construct, especially for racial/ethnic minorities [26, 27], SES was indexed as the average of standardized parent-reported highest level of education completed by any member of the household (6 categories: 1 = < 9th grade, 6 = > Bachelor degree) and total household income combined from all members and considering 14 income sources (20 categories: 1 = < \$5,000/year, 20 = ≥ \$250,000/year). Two additional family contextual variables were captured from parent report: *child residing with both biological parents*

(dichotomous) [28, 29] and degree to which *English is spoken at home* (5 categories, 1 = *No, not at all*, 5 = *Yes*) [30, 31].

Analysis

As detailed elsewhere [3, 19], the sampling frame included all 5th-grade students in regular classrooms in public schools with at least 25 5th-grade students in the Birmingham, Houston, and Los Angeles metropolitan areas. Schools and students were selected using a two-stage probability sampling procedure. Stratified sampling was used to achieve similar numbers of Black, Latino, and White participants. Probability weights were constructed to reflect the sampling design and non-response to follow-up. Consequently, weighted results from using the SPSS Complex Sampling module reported here are adjusted for any bias due to differential attrition over time and thus represent the population in the sampling frame.

The HRQOL measures (Physical HRQOL, Psychosocial HRQOL, Total HRQOL) were measured on continuous scales, whereas the two OHS measures (by youth- and parent report) employed five-point ordinal scales, which were analyzed as linear. Whereas descriptive information is provided for the outcome variables in their original measurement scales, standardized Z scores (based on the *M* and S.D. obtained for the total sample on each variable at each assessment, *M* = 0.00, S.D. = 1.00) were used for all analyses to enable comparisons of parameters across variables. The distribution of all model residuals adequately conformed to the assumptions for the General Linear Model (GLM), which was applied to each outcome measure as follows: (1) In the first step, the GLM model consisted of main effects for race/ethnicity and sex and their interaction. Because no interaction reached significance ($p < 0.05$), the interaction was dropped from the model and the analysis was repeated with just the main effects. The main effect for sex was retained in all models, but because it is not pertinent to any of the aims it is not addressed here. (2) In the second step, the GLM analysis included race/ethnicity and sex with adjustment for SES. (3) In the third step, the fully adjusted GLM model added the two family contextual variables. These steps were repeated for the 5th, 7th, and 10th grade data. To reduce effects due to examining five conceptually related outcome variables, a Bonferroni corrected $p < 0.01$ ($0.05/5$) was used to test main effects. Significant main effects for race/ethnicity were explored *post hoc* with Wald *F* tests with significance set at $p < 0.01$. Effect sizes for racial/ethnic main effects were calculated as Cohen’s *d*, which are considered as small ≥ 0.20 , medium ≥ 0.50 , and large ≥ 0.80 .

Results

Sample demographics

As shown in Table 1, White youth were reported to live in families with higher household education level than Black youth, who had higher household education level than Latino youth. Similarly, White youth were reported to live with higher household income than Black or Latino youth. White youth also were reported more often to reside with two biological parents at home than Latino youth, who more often resided with two biological parents than Black youth. Finally, Latino youth had families reporting lesser use of English at home than Black or White youth.

Racial/ethnic disparities

Table 2 reports unadjusted descriptive statistics for the outcome variables and Table 3 reports results from the three GLM models. The standardized means for all outcome variables by race/ethnicity are graphed in Fig. 1, based on the unadjusted as well as the two adjusted models. The effect sizes (Cohen's *d*) for the differences among the racial/ethnic groups for each outcome variable at each assessment are reported in Table 4.

There were significant unadjusted differences among racial/ethnic groups across all five outcomes in both 5th and

7th grades (see Table 3) and across two in 10th grade. White youth generally had better outcomes than Black youth, who in turn generally had better outcomes than Latino youth. Although racial/ethnic differences were typically no more than small in effect size, several between White and Latino youth were of medium and even large size (see Table 4). Medium and large differences occurred especially for OHS ratings. Exceptions to this general pattern were that White and Black youth did not differ in Physical HRQOL in 7th and 10th grade nor Total and Psychosocial HRQOL in 10th grade; White youth did not differ from Latino youth in Total, Physical, and Psychosocial HRQOL in 10th grade; and Black youth did not differ from Latino youth in Total or Psychosocial HRQOL in 5th and 10th grade or Physical HRQOL in 10th grade.

Adjusting for SES

As shown in Table 3, when adjusting for SES, the pattern of significant racial/ethnic main effects was highly similar to the unadjusted effects across the 5th, 7th, and 10th grade, except for there being no racial/ethnic differences for Total or Psychosocial HRQOL in 5th grade after SES adjustment. The size of these racial/ethnic effects, however, generally decreased such that none exceeded small and several no longer reached this criterion (see Table 4). Whereas the order among the racial/ethnic groups when adjusted for SES also remained the same compared to the

Table 2 Unadjusted means (and standard error) for health-related quality of life and health status in 5th, 7th, and 10th grade

Outcome variable	Score range	Total sample	Black	Latino	White
5th grade (age <i>M</i> = 11.16)					
Total HRQOL	0–100	76.21 (0.43)	75.97 (0.48)	74.26 (0.49)	80.45 (0.61)
Physical HRQOL	0–100	83.16 (0.46)	83.51 (0.48)	80.37 (0.51)	88.34 (0.48)
Psychosocial HRQOL	0–100	72.74 (0.45)	72.20 (0.56)	71.21 (0.54)	76.51 (0.74)
Overall health status CR	1–5	3.51 (0.03)	3.67 (0.03)	3.23 (0.04)	3.87 (0.04)
Overall health status PR	1–5	3.91 (0.04)	3.97 (0.03)	3.59 (0.04)	4.51 (0.03)
7th grade (age <i>M</i> = 13.10)					
Total HRQOL	0–100	82.49 (0.32)	83.39 (0.45)	80.22 (0.35)	85.84 (0.45)
Physical HRQOL	0–100	89.87 (0.28)	91.28 (0.44)	87.72 (0.34)	92.32 (0.49)
Psychosocial HRQOL	0–100	78.78 (0.37)	79.44 (0.53)	76.43 (0.42)	82.60 (0.55)
Overall health status CR	1–5	3.57 (0.03)	3.72 (0.04)	3.25 (0.04)	4.02 (0.03)
Overall health status PR	1–5	3.99 (0.04)	4.03 (0.03)	3.69 (0.03)	4.53 (0.04)
10th grade (age <i>M</i> = 16.12)					
Total HRQOL	0–100	80.20 (0.22)	80.72 (0.38)	80.11 (0.28)	79.68 (0.48)
Physical HRQOL	0–100	89.85 (0.26)	90.32 (0.41)	89.51 (0.40)	89.90 (0.48)
Psychosocial HRQOL	0–100	75.38 (0.28)	75.94 (0.50)	75.42 (0.35)	74.54 (0.60)
Overall health status CR	1–5	3.61 (0.03)	3.70 (0.03)	3.42 (0.03)	3.85(0.04)
Overall health status PR	1–5	3.92 (0.04)	3.99 (0.04)	3.63 (0.04)	4.43(0.04)

Higher values indicate healthier report on all variables

HRQOL health-related quality of life, CR child report of child's overall health status, PR parent report of child's overall health status

Table 3 Disparities in health-related quality of life and health status associated with race/ethnicity

Outcome variable	Main effect for race/ethnicity by Wald <i>F</i> test (<i>post hoc</i> differences among racial/ethnic groups)		
	Unadjusted	SES adjusted	Fully adjusted ^a
5th grade (age <i>M</i> = 11.16)			
Total HRQOL	31.85 (W > B, L)**	1.78 (n.s.)	3.78 (n.s.)
Physical HRQOL	64.99 (W > B > L)**	9.20 (W, B > L)**	7.45 (W > L)*
Psychosocial HRQOL	17.64 (W > B, L)**	0.39 (n.s.)	1.96 (n.s.)
Overall health status CR	77.95 (W > B > L)**	44.85 (W, B > L)**	18.92 (W, B > L)**
Overall health status PR	195.77 (W > B > L)**	61.79 (W > B > L)**	27.38 (W > L, B)**
7th grade (age <i>M</i> = 13.10)			
Total HRQOL	42.29 (W > B > L)**	19.51 (W, B > L)**	13.10 (W, B > L)**
Physical HRQOL	31.91 (W, B > L)**	15.63 (W, B > L)**	7.42 (W, B > L)*
Psychosocial HRQOL	35.71 (W > B > L)**	17.49 (W > B > L)**	11.79 (W, B > L)**
Overall health status CR	113.85 (W > B > L)**	46.37 (W, B > L)**	30.84 (W, B > L)**
Overall health status PR	144.52 (W > B > L)**	35.57 (W > B > L)**	15.44 (W > B, L)**
10th grade (age <i>M</i> = 16.12)			
Total HRQOL	2.16 (n.s.)	2.48 (n.s.)	4.85 (n.s.)
Physical HRQOL	0.87 (n.s.)	2.23 (n.s.)	2.26 (n.s.)
Psychosocial HRQOL	2.25 (n.s.)	1.49 (n.s.)	4.62 (n.s.)
Overall health status CR	54.65 (W > B > L)**	14.02 (B, W > L)**	6.29 (B, W > L)*
Overall health status PR	113.77 (W > B > L)**	32.01 (W > B > L)**	10.97 (W > B, L)**

Post hoc group differences at $p < 0.01$ indicated to the right of significant Racial/Ethnic main effect (B, Black; L, Latino; W, White), where > indicates healthier report

SES socioeconomic status, HRQOL health-related quality of life, CR child report, PR parent report, (n.s.) statistically not significant

* $p < 0.01$

** $p < 0.001$

^aAdjusted for SES, residing with 2 biological parents, and degree of English spoken at home

unadjusted results for several outcomes, this changed for seven outcomes. Black youth no longer differed from White youth when equated on SES for Total HRQOL in 5th and 7th grade, Physical and Psychosocial HRQOL in 5th grade, and child-rated OHS across all three grades. However, even when the comparisons were adjusted for SES, Latino youth generally had poorer outcomes than the other two racial/ethnic groups. Exceptions were for Total and Psychosocial HRQOL in 5th and 10th grade and Physical HRQOL in 10th grade when Latino youth were not different from either of the other two groups.

Adjusting for SES and other family contextual differences

When adjusting also for family contextual variables, the overall pattern of significant racial/ethnic main effects was the same as that reported for the SES-adjusted comparisons (see Table 3). Outcomes continued to yield significant racial/ethnic main effects, except for Total and

Psychosocial HRQOL in 5th and 10th grade and Physical HRQOL in 10th grade. The effect size of these fully adjusted racial/ethnic differences was largely similar to the no more than small effects noted for the SES-adjusted comparisons (see Table 4). Exceptions were for parent-reported OHS across the three grades, where the White-Latino effects decreased more substantially (change in $d \geq 0.13$) when fully adjusted compared to only SES adjusted.

The number of significant differences between specific racial/ethnic groups was also reduced when comparisons were fully adjusted (see Table 3). White youth had better outcomes compared to Black youth only for parent-reported OHS across all three grades. Nonetheless, White youth generally had better outcomes than Latino youth also when adjusting for family contextual factors, except for Total and Psychosocial HRQOL in 5th and 10th grade, and Physical HRQOL in 10th grade. Black youth had better outcomes than Latino youth in child-reported OHS across all three grades, and Total, Physical, and Psychosocial HRQOL in 7th grade.

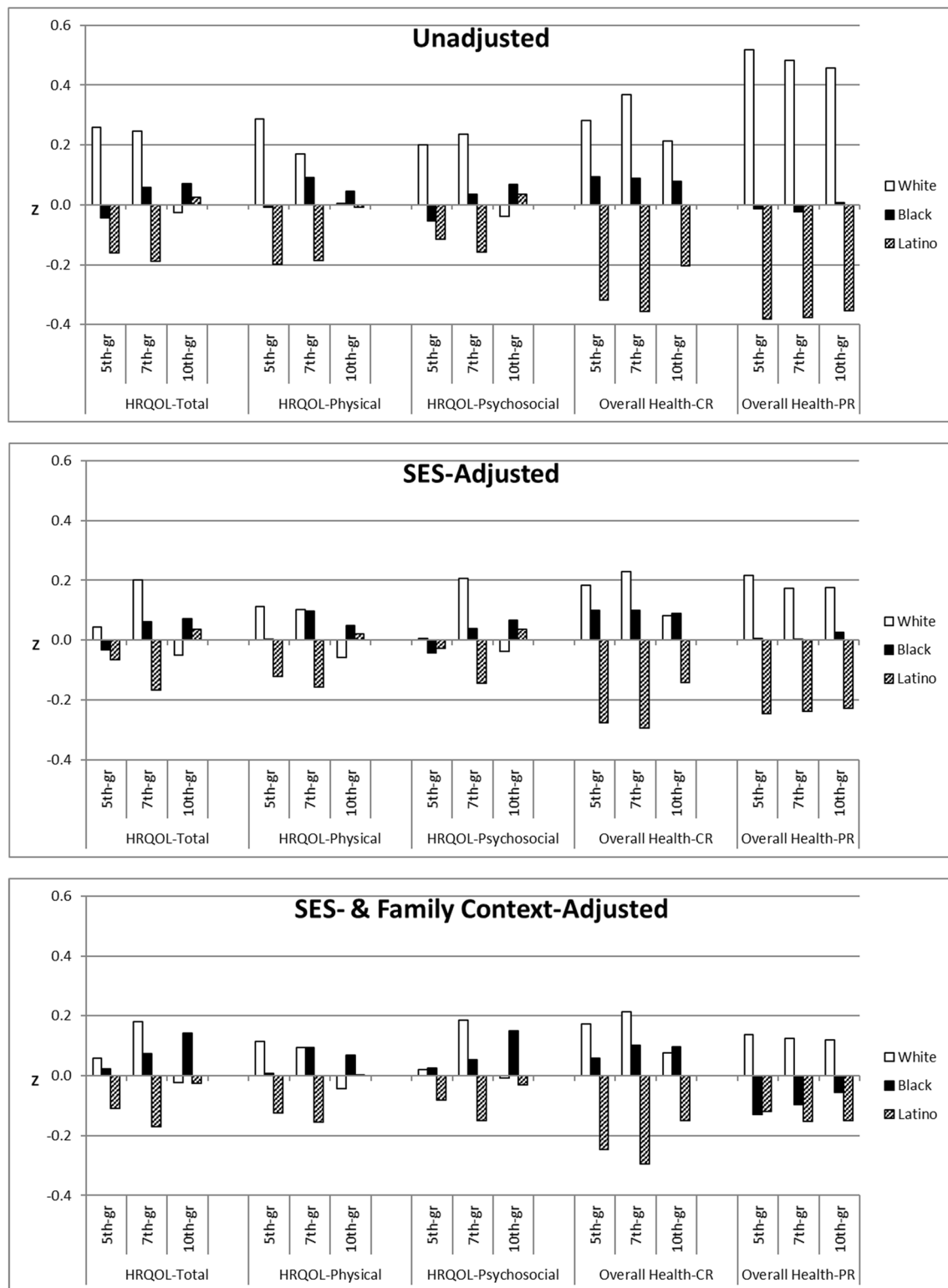


Fig. 1 Racial/ethnic group means (Z score transformed) for health-related quality of life and health status. Race/ethnicity and sex included in all models. Top panel, unadjusted; center panel, SES

adjusted; bottom panel, SES- and family context-adjusted; *HRQOL* health-related quality of life, *CR* child report, *PR* parent report

Table 4 Effect sizes (Cohen's $d > 0.20$) corresponding to disparities between White, Black, and Latino youth in health-related quality of life and health status

Outcome variable	Grade	Unadjusted			SES adjusted			Fully adjusted ^a		
		White vs. Black	White vs. Latino	Black vs. Latino	White vs. Black	White vs. Latino	Black vs. Latino	White vs. Black	White vs. Latino	Black vs. Latino
HRQOL-total	5th	0.30	0.42							
	7th		0.44	0.25		0.37	0.23	0.35		0.25
	10th									
HRQOL-physical	5th	0.29	0.49			0.24		0.24		
	7th		0.35	0.28		0.26	0.25	0.25		0.25
	10th									
HRQOL-psycho-social	5th	0.26	0.31							
	7th	0.20	0.39			0.35		0.33		0.20
	10th									
Overall health-child rating	5th		0.60	0.41		0.46	0.38	0.42		0.30
	7th	0.28	0.73	0.45		0.52	0.39	0.51		0.40
	10th		0.41	0.28		0.22	0.23	0.23		0.25
Overall health-parent rating	5th	0.53	0.90	0.37	0.21	0.46	0.25	0.27	0.26	
	7th	0.51	0.86	0.35		0.41	0.24	0.22	0.28	
	10th	0.45	0.81	0.36		0.40	0.26	0.27		

Only $d \geq 0.20$, considered to be at least small by convention, are included. Italics indicate medium $d \geq 0.50$; bold indicates large $d \geq 0.80$

SES socioeconomic status, HRQOL health-related quality of life

^a Adjusted for SES, residing with 2 biological parents, and degree of English spoken at home

Discussion

Findings indicate that considerable disparities are present across broad health indicators among the three major racial/ethnic groups in the United State in pre- and early-adolescence, ages 10–13. More specifically in this developmental period, White youth are quite consistently advantaged compared to Black and Latino youth, Latino youth are consistently disadvantaged compared to the other two groups, and Black youth generally fall between White and Latino youth in broadly construed health. However, disparities disappear *to some extent* by ages 15–16, at least for youth-reported HRQOL. This is contrasted with overall health status, where parents in particular report disparities in their children's overall health from pre-, to early-, to mid-adolescence, as shown in Fig. 1. These racial/ethnic disparities and non-disparities are consistent for both genders.

However, as also shown in Fig. 1, the health advantages for White compared to Black youth are substantially reduced when the socioeconomic differences that are present are covaried. Indeed, when controlling for these differences, White and Black youth are no longer different for almost all health outcomes. Yet, even though the disparities are reduced also for parent-reported health status when adjusting for SES and other family contextual differences, parents' perceptions of children's health remain disparate for both Black and Latino youth, but especially for Latino youth. Thus racial/ethnic disparities in HRQOL and overall health during adolescence appear partially influenced by socioeconomic and family contextual variables, yet in different ways for Black and Latino youth. Future research should examine what additional culturally related variables can account for the observed racial/ethnic health disparities in adolescence beyond those examined here. We suggest that variables such as perceived inequality and discrimination experiences, among others, be considered. For Latino youth specifically, acculturation should also be examined.

We are not aware of any study that has examined developmental expressions of disparities in broadly construed health during adolescence. Other research has focused on a specific age range or combined broad ages. Moreover, whereas there has been extensive reporting of disparities in morbidity and mortality and other specific health indicators [1], only a few studies have examined child health in terms of overall health status [11–16]. Consistent with our findings, most of these studies found racial/ethnic disparities in *parent-reported* overall child health status, which remained when controlling for SES [12, 15, 16].

Yet, few studies have examined disparities in *youth self-reported* health. We find significant disparities here

too, but they diminish and, in some cases, disappear when adjusting for family contextual differences. Moreover, youth-reported disparities are reduced and mostly disappear over development from ages 10 to 16. These findings suggest that *how* we conceptualize and measure health status matters when examining disparities, as well as *when* we examine them in adolescent development. Specifically, parent report of child health strongly reflects racial/ethnic disparities, whereas youth self-report does so less, especially by mid-adolescence. This observed differentiation between a parent's and youth's perception of the youth's health during adolescence may reflect individuation, which is a normative developmental process in mid-adolescence [32]. Possibly explaining the reduction in disparities later in adolescent development, we can raise the hypothesis that, by mid-adolescence, youth's *perceived* health is less influenced by the family contextual factors than by peer factors compared to earlier in development. This would affect self-ratings more so than parent ratings. Future research is needed to test this hypothesis. Given discrepant findings from these two perspectives on health, multi-informant assessment should be examined further to understand more specific influences on parent vs. youth perceptions of youth health.

Limitations

The observational design prevents causal determination of racial/ethnic disparities. Voluntary participation can result in selection bias, so different patterns of enrollment by race/ethnicity could have biased estimates of disparities. Information was not available to determine whether participants had a chronic health condition and how this may have influenced their HRQOL and health status. Because three geographic regions provided the participants according to an a priori sampling plan, this is not a nationally representative sample. Moreover, the Latino participants were enrolled primarily in the Houston and Los Angeles areas and primarily represent heritage from Mexico. Other Latino subgroups may have different characteristics [3, 12]. Only a limited set of contextual variables potentially influencing youth health were considered here.

Public health implications

Documenting health in childhood should routinely incorporate broader measures of health than typically achieved with traditional mortality and morbidity indicators. Broad measures of health are more useful for describing the health of children in the population and various subgroups more comprehensively than conventional mortality and morbidity measures [33]. These measures can better identify groups with high rates of unrecognized conditions, social and

emotional problems, and poor functioning [34, 35]. With HRQOL and health status measures, it should be possible to capture better the variability in children's health in the population, which generally is predominantly healthy. Reflecting this utility, Healthy People 2020 [36] states as one of its overarching goals to promote "quality of life, healthy development, and health behaviors across all life stages." HRQOL and health status therefore should be routinely added to epidemiological data collections documenting children's health.

Moreover, since its inception, one overarching goal of Healthy People has focused on reducing disparities [36]. Despite this steadfast focus, *both* racial/ethnic and socioeconomic health disparities remain profoundly present already in childhood in the United States. Yet, we know that HRQOL can be improved across racial/ethnic and low SES groups of children through realized access to health care, as has been demonstrated, for example, in the California State Children's Health Insurance Program [37]. Addressing the relationship between social conditions, including access to care, and health early in development is critical for optimizing health throughout life [18]. In addition, disparities in child health carry large social and financial costs [38]. As inequalities expand in the most developed countries, societies should keep in mind these looming costs as larger portions of the population are exposed to the conditions underlying the health disparities we see today.

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Compliance with ethical standards

Conflict of interest The authors have no conflict of interest to disclose.

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